



Pearl[®] *Struvite crystallisation in sludge liquor*

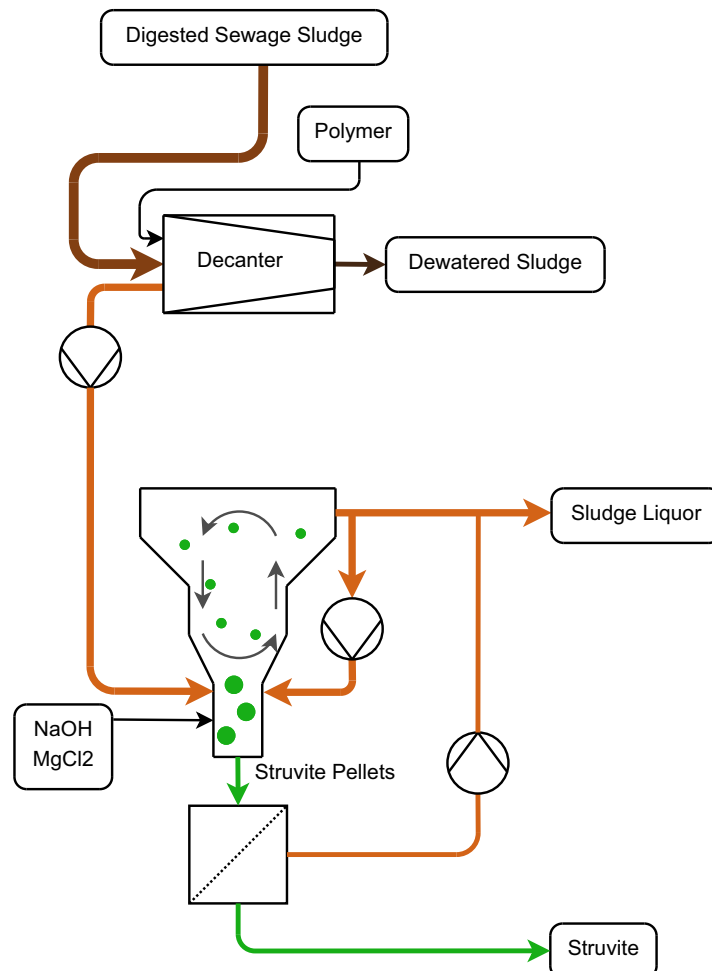
Short description

The Pearl[®] process is developed and commercialized and licenced by OSTARA Nutrient Recovery Technologies Inc. (Vancouver, Canada) which specializes in nutrient recovery from municipal and industrial wastewaters. Pearl[®] is designed to prevent unwanted struvite incrustation after sludge dewatering in EBPR WWTPs. It is currently operated at several WWTPs in Canada, the US and the UK.

The crystallization reactor is installed directly after the dewatering unit and treats the sludge liquor. Struvite is

precipitated by dosing MgCl₂ and increasing pH with NaOH dosing. Internal recirculation in the PEARL[®] reactor assures proper mixing and good crystal growth, while the specially designed reactor shape guarantees uniform crystal size and optimum hydraulic conditions. Crystalline pellets reaching the desired size sink to the bottom of the reactor where they are harvested. The extracted struvite prills are dried in a fluidized bed dryer. The product (Crystal Green[®]) is very uniform and highly pure.

Process scheme



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General Data

Type of Process	crystallisation
Type of Plant	crystallization reactor
Input Material	sewage sludge liquor
Product	struvite
P-concentration	28 % P ₂ O ₅ of DM
P recovery performance ¹	12 % of P in sludge input

Supply

Average total electricity demand ¹	2.2 [kWh/kg P _{recovered}]
Average total heat demand ¹	1.8 [kWh/kg P _{recovered}]
Average chemical demand ¹ (as 100% concentrate)	3.1 [kg MgCl ₂ /kg P _{recovered}] 1.0 [molar ratio MG:P _{recovered}] 0.8 [molar ratio Mg:P _{dissolved}] 0.2 [kg NaOH/kg P _{recovered}]

Advantages

- WWTP retrofit possible by implementation after centrifuge
- Prevention of struvite incrustations after centrifuge
- High purity of struvite product and defined prill size
- Proportional reduction of phosphorus and nitrogen return load from sludge liquor

Remarks

- The process is limited to WWTP with enhanced biological P removal and more than 50 mg/L PO₄-P in sludge liquor
- Product yield can be enhanced by thermal or chemical hydrolysis (increase of PO₄-P in sludge liquor)
- In combination with WASSTRIP® process for P release prior to digestion, P recovery can be significantly increased while improving sludge dewaterability and digester capacity

Patents and Licenses

Patent held by	Ostara Nutrient Recovery Technology Inc.
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References

Hillsboro (Oregon)

Start of operation	2012
Scale	930 t struvite/a

London (Slough)

Start of operation	2013
Scale	150 t struvite/a

¹Process data related to reference sludge line defined in P-REX (digested sludge of wastewater treatment plant for 1 Mio inhabitant equivalents, dry matter (DM) content: 3%, P content: 4.2% of DM, PO₄-P in liquor: 200 mg/L (EBPR) or 10 mg/L (ChemP), Fe content: 2% (EBPR) or 6.6% (ChemP)). More information on modelling can be found in P-REX LCA report.